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PCT App. No.:

Claim Listing

1–10. (cancelled)

11. (new) An array of nozzles for use in coating by high-pressure spraying techniques a web of material moving in a first direction, the array of nozzles comprising:

at least one row of a plurality of nozzles oriented transverse to the first direction;

wherein each nozzle is comprised of a tapered duct ending in a closed tip in which a V-shaped groove has been machined, the V-shaped groove defining a nozzle orifice defining a transverse area, the nozzle orifice arranged to form a jet of coating material; and

wherein the V-shaped groove has a first side and second side which intersect to define an angle which is between 25 to 50 degrees.

12. (new) The array of nozzles of claim 11, in which the angle is between 35 to 45 degrees.

13. (new) The array of nozzles of claim 11, wherein each nozzle orifice transverse area is oval in shape.

14. (new) The array of nozzles of claim 11, wherein the orifice defines a maximum diameter and a minimum diameter and a ratio between said maximum diameter and said minimum diameter which is greater than 1.2.

15. (new) The array of nozzles of claim 14, wherein the ratio is between 1.2 and 3.

16. (new) The array of nozzles of claim 15, wherein the ratio is between 1.5 and 2.5.

17. (new) The array of nozzles of claim 11, wherein the nozzle orifice has dimensions of between 1.0–0.3 mm by between 0.5–0.1 mm.

18. (new) The array of nozzles of claim 17, wherein the nozzle orifice has dimensions of between 0.75–0.4 mm by between 0.35–0.15 mm.

19. (new) The array of nozzles of claim 11, wherein each nozzle comprises:

a preliminary nozzle having portions forming a flow orifice, the flow orifice defining an area;

a secondary nozzle having the nozzle orifice, the nozzle orifice arranged to form a jet of coating material, the secondary nozzle being connected to the preliminary nozzle; and

wherein the preliminary nozzle is arranged to form a preliminary diffuser for the nozzle orifice.

20. (new) The array of nozzles of claim 19, wherein each preliminary nozzle comprises an expanding duct.

21. (new) The array of nozzles of claim 19, wherein each preliminary nozzle flow orifice defines a flow orifice area which is at the most 1.1 times the transverse area of the nozzle orifice of the connected secondary nozzle.

22. (new) The array of nozzles of claim 21, wherein the flow orifice area of the preliminary nozzle is at most equal to the transverse area of the nozzle orifice of the connected secondary nozzle.

23. (new) The array of nozzles of claim 19, wherein the flow orifice of the preliminary nozzle has a diameter of between 0.1 mm and 1 mm.

24. (new) The array of nozzles of claim 23, wherein the diameter of the flow orifice of the preliminary nozzle is between 0.25 and 0.55 mm.

25. (new) The array of nozzles of claim 19, wherein the area of the flow orifice of the preliminary nozzle is equal to or less than 50 percent of the transverse area of the nozzle orifice of the connected secondary nozzle.

26. (new) The array of nozzles of claim 25,wherein the area of the flow orifice of each preliminary nozzle is equal to or less than 20 percent of the transverse area of the nozzle orifice of the connected secondary nozzle.

27. (new) The array of nozzles of claim 11 wherein the web of material is a paper web.

28. (new) A method of coating a paper web by high-pressure spraying comprising the steps of:

moving a paper web or cardboard web in a first direction past an array of a plurality of high-pressure secondary spray nozzles which are arrayed transverse to the first direction;

supplying each secondary spray nozzle of the array with a flow of coating by supplying coating at a pressure of 1 MPa to 200 Mpa first to a preliminary nozzle then to the secondary spray nozzle, which is connected to the preliminary nozzle;

wherein the flow of coating flows first through portions of the preliminary nozzle forming a flow orifice, the flow orifice defining an area, then the flow of coating flows through portions of the preliminary nozzle forming an expanding duct;

thereafter the coating flows into a portion of the secondary nozzle forming a tapered duct ending in a tip which is closed but for portions of the secondary nozzle forming a transverse V-shaped groove having a first side and a second side which intersect to define an angle which is between 25 to 50 degrees, the V-shaped groove intersecting the tip to form a nozzle orifice defining a transverse area; and

discharging the flow of coating through the nozzle orifice to form a jet of coating material directed at the paper web or cardboard web, wherein the expanding duct of the preliminary nozzle forms a preliminary diffuser for the flow orifice.

29. (new) The method of claim 28 wherein the nozzle orifice defines a maximum diameter and a minimum diameter and a ratio between said maximum diameter and said minimum diameter which is greater than 1.2.

30. (new) The method of claim 28 wherein the flow orifice area is at most 1.1 times the transverse area of the nozzle orifice.

31. (new) The method of claim 28 wherein the flow orifice of the preliminary nozzle has a diameter of between 0.1 mm and 1 mm.

32. (new) The array of nozzles of claim 28 wherein the area of the flow orifice of the preliminary nozzle is equal to or less than 50 percent of the transverse area of the nozzle orifice of the secondary nozzle.

33. (new) An array of nozzles with reduced wear characteristics for use in coating by high-pressure spraying techniques a moving web of paper or cardboard mounted for motion in a first direction, the array of nozzles comprising:

at least one row of a plurality of secondary spray nozzles which are arrayed transverse to the first direction;

wherein each secondary nozzle has portions defining a tapered duct which ends with a tip which is closed but for portions of the nozzle forming a transverse V-shaped groove which intersects the tip, thereby defining a nozzle orifice defining a transverse area, the nozzle orifice arranged to form a jet of coating material; and

wherein the V-shaped groove has a first side and second side which intersect to define an angle which is between 25 to 50 degrees, wherein each secondary nozzle is connected to a preliminary nozzle, so that the tapered duct ending with a tip is in flow receiving relation to portions of the preliminary nozzle forming an expanding duct which in turn is in flow receiving relation to portions of the preliminary nozzle forming a flow orifice, the flow orifice defining an area, the flow orifice in flow receiving relation to a supply of coating at a pressure between 1 MPa and 200 Mpa.

34. (new) The array of nozzles of claim 33, wherein the nozzle orifice defines a maximum diameter and a minimum diameter and a ratio between said maximum diameter and said minimum diameter which is greater than 1.2.

35. (new) The array of nozzles of claim 33 wherein the preliminary nozzle flow orifice area is at the most 1.1 times the transverse area of the nozzle orifice of the connected secondary nozzle.

36. (new) The array of nozzles of claim 33 wherein the flow orifice of the preliminary nozzle has a diameter of between 0.1 mm and 1 mm.

37. (new) The array of nozzles of claim 33 wherein the area of the flow orifice of the preliminary nozzle is equal to or less than 50 percent of the transverse area of the nozzle orifice of the connected secondary nozzle.

38. (new) The array of nozzles of claim 33 wherein the the preliminary nozzle has a flow orifice which is at the most 1.1 times the transverse area of the nozzle orifice of the connected secondary nozzle.